

Gallagher, et al.

USSN: 08/704,467

Filed: August 28, 1996

Page 4

This process produces a strong mechanical, thermal and electrical interconnect which ensures good conductivity that is also resistant to humidity and temperature cycling.

By the present communication claims 1, 2, 16 and 17 have been amended to define Applicants' invention with greater particularity and not in response to any properly citable prior art. No new matter is introduced by the subject amendments as the amended claim language is fully supported by the specification and original claims. Claims 21-23 have been withdrawn from consideration.

Accordingly, claims 1-23 are pending.

The rejection of claims 1-20 under 35 U.S.C. § 112, second paragraph, is respectfully traversed.

Applicants respectfully disagree with the Examiner's assertion that the optional metal additive component is allegedly indefinite because it overlaps in definition with the high melting point and/or low melting point metals referenced in the same claim (see page 6 of the Office Action). Contrary to the Examiner's assertion, the claims are respectfully submitted to be definite, especially given the context of the claim language and Applicants' specification. The definition of metal additive (see, e.g., Applicants' specification pages 20-21) makes it clear that the metal additive may be similar to the high or low melting point metals in that the additive may be a metal ball of a particular size range; however, the metal additive can also be a coating on the high or low melting point metal component, or it can be pre-alloyed with either the high or low melting point metal. Thus, the definitions, while potentially overlapping, are respectfully submitted to be used in the claim in such a manner that is clear. Indeed, it would be nonsensical for the metal additive employed in a particular embodiment to be the same as either the high or low melting point metal chosen for that particular embodiment.

The Board's holding in *Ex parte Ferm & Boynton*, 162 U.S.P.Q. 504 (BPAI 1969), as cited by the Examiner, for the proposition that claims in which one component reads on a second fail to meet

Gallagher, et al.

USSN: 08/704,467

Filed: August 28, 1996

Page 5

the requirements of § 112, second paragraph, is of no value under the present circumstances. The Board makes it clear that prior to any determination that claims are indefinite as potentially overlapping, reference should be made to the specification. Applying this rule to the present case, the language at issue, taken in the context of the claim language and Applicants' specification, is clearly definite.

Applicants respectfully disagree with the Examiner's assertion that the definitions of "resin" and "reactive monomer or polymer" overlap in a manner to allegedly make the claims indefinite. (Paper No. 7, page 6). When read in context, it is respectfully submitted that the claim language is clear --- the resin and the reactive monomer or polymer are not the same. In order to obviate this issue, thereby reducing the number of issues herein, claims 1 and 2 have been amended herewith to explicitly state that the two components are not the same.

Applicants respectfully disagree with the Examiner's assertion that the term "chemically reactive crosslinking agent" is allegedly vague and indefinite. (Paper No. 7, page 6). The term is clearly defined in Applicants' specification, for example, at pages 15-16. Contrary to the Examiner's assertion, the claims, when read in light of the specification, provide clear notice to those skilled in the art of the metes and bounds of the claimed subject matter. The Examiner acknowledges as much by suggesting that the definition from the specification be explicitly included in the claim. While not believed to be necessary, in order to reduce the number of issues, claim 1 has been amended to incorporate the suggested language.

Claims 16 and 17 have been amended to delete the parenthetical and instead place the adjectives "phenolic" and "cresolic" before the term "novalac" as suggested by the Examiner. The Examiner's suggestion of acceptable alternative claim language is acknowledged with appreciation.

Gallagher, et al.

USSN: 08/704,467

Filed: August 28, 1996

Page 6

The rejection of claims 1-20 under 35 U.S.C. § 103(a), as allegedly being unpatentable over Kawamura (Japanese Kokai No. 53-133799) and Hicks, et al. (U.S. Pat. No. 4,434,084) is respectfully traversed.

Applicants' invention, as defined by claim 1, distinguishes over the prior art by requiring a conductive adhesive composition containing a combination of metal powders that are substantially spherical. In contrast, Kawamura describes a conductive coating that requires metal in the form of flat flakes. (Kawamura translation, page 4, line 1).

Applicants' invention, as defined by claim 1, further distinguishes over the prior art by requiring a conductive adhesive composition containing a chemically protected crosslinking agent that only becomes reactive at or near the time certain of the metal components of the composition melt. As acknowledged by the Examiner, neither Hicks nor Kawamura specifically disclose the use of chemically protected crosslinking agents. (Paper No. 7 at page 11).

Applicants respectfully disagree with the Examiner's assertion that Kawamura and Hicks allegedly disclose the use of chemically protected crosslinking agents by implication. (Paper No. 7 at page 11). The Examiner's assertion is apparently based on the processing temperature disclosed by Kawamura, taken together with Hicks' requirement that the organic acid flux remain stable to temperatures at which the intermetallic compounds are formed. The mere observation that the Kawamura process occurs in the same temperature range as Applicants' process in no way suggests the use of chemically protected cross linking agents. Moreover, Applicants' claims are directed to compositions, not methods, and therefore the processing temperature itself is respectfully submitted to be irrelevant. Hicks only describes the need for thermal stability, i.e., requiring that fluxing compounds do not volatilize or thermally decompose prior to the sintering reaction. There is no suggestion that the fluxing compounds used by Hicks are not reactive at low temperatures.

Gallagher, et al.  
USSN: 08/704,467  
Filed: August 28, 1996  
Page 7

Applicants' invention, as defined by claim 1, distinguishes over the combination of Kawamura and Hicks by requiring that fluxing compounds employed in the claimed composition be chemically protected in a manner that delays their reactivity until a predetermined temperature that is at or below the melting point of the metal components of the composition, yet high enough so that the flux does not react substantially with the resin and/or polymer until just prior to melting. In this manner fluxing is delayed until an elevated temperature such that the metal is cleaned just prior to sintering, thereby leaving little time for re-oxidation. Neither Hicks nor Kawamura disclose or suggest such delayed reactivity.

Moreover, neither Hicks nor Kawamura disclose or suggest the surprising and unexpected properties that Applicants have discovered resulting from the use of chemically protected crosslinking agents. In the invention compositions, the acid and/or basic functionalities of the cross linking agents serve the dual role of fluxing the high melting point metal or alloy, and curing the resin and/or polymer component. It would commonly be expected that chemically protecting the functional groups such that they remain inert until at or near the melting point of the composition metals would render the compound ineffective as a fluxing agent. Surprisingly it has been determined that such chemically protected functional groups remain effective fluxing agents even in formulations where curing of the resin and/or polymer component substantially occurs at a temperature much higher than the low melting point metal or alloy. Furthermore, since deprotection of chemically protected materials is most commonly affected by chemical means, it was unexpected that one could successfully engineer, as have Applicants, a protected species that would thermally dissociate to the reactive species at a desired temperature. It is respectfully submitted that the Examiner has not given any reason to infer that such surprising and unexpected results were implied by either Hicks or Kawamura. Thus, Applicants submit that neither Hicks nor Kawamura, taken alone or in combination, would render obvious the present invention compositions.

The provisional rejection of claims 1-20 under the doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 21-22, 24-35 and 37-50 of copending Application Serial No. 08/324,060 is acknowledged. Applicants will address these issues after all

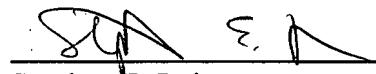
Gallagher, et al.  
USSN: 08/704,467  
Filed: August 28, 1996  
Page 8

other issues have been resolved and the claims are otherwise in condition for allowance (e.g., by cancellation of one of the sets of conflicting claims, by submission of a Terminal Disclaimer, or such other action is deemed appropriate).

In view of the above amendments and remarks, reconsideration and favorable action on all pending claims are respectfully requested. If any questions or issues remain, the Examiner is invited to contact the undersigned at the telephone number set forth below so that a prompt disposition of this application can be achieved.

Respectfully submitted,

Date: 21/09/98

  
Stephen E. Reiter  
Registration No. 31,192  
Telephone: (619) 677-1409  
Facsimile: (619) 677-1465

GRAY, CARY, WARE & FREIDENRICH, LLP  
4365 Executive Drive, Suite 1600  
San Diego, California 92121-2189